

Sensitive Areas and Practices Workgroup – 03-23-2016 - RED text reflects workgroup discussion from March 17, 2016 meeting
DRAFT Bedrock Depth Recommendations - 0-2 feet

Avoidance is the best practice for effective groundwater protection on soils 0-2 feet. The mitigation practices that follow reflect interim or intermediate steps that farmers can implement on a voluntary basis to protect groundwater.

Applying manure on soils with 36 inches or greater depth to bedrock is best for pathogen reduction.

None of the mitigation practices are meant to override meeting current performance standards (e.g., NR 151 and NR 243) or technical standards (e.g., NRCS 590) related to nutrient management or soil conservation.

0-2 feet to bedrock	Practices
	1. 0-1 feet - No mechanical application of manure
	2. 1-2 feet - Avoid mechanical application of manure on these soils and use other available acres, OR, if avoidance not possible, implement all of the following mitigation practices: a. No liquid manure applications b. No fall manure applications c. Apply only solid manure in spring d. Limit solid manure application rate to 15 tons/acre/year e. Apply within 10 days or less from planting date or apply on a growing crop
	2. Use NRCS soil units/maps or DNR CAFO maps and field verification to identify location of soils
	3. Livestock may be pastured on these soils as long as the following are met: a. Pasture is maintained in adequate, perennial vegetation; b. Vegetation is maintained year round; c. Producer develops and implements a grazing plan; and d. The grazing plan, at a minimum, meets both NRCS Standard 590, Nutrient Management (2015) https://efotg.sc.egov.usda.gov/references/public/WI/590_Standard-(2015-12).pdf and NRCS 528, Prescribed Grazing https://efotg.sc.egov.usda.gov/references/public/WI/528.pdf

Sensitive Areas and Practices Workgroup
DRAFT Bedrock Depth Recommendations - 2-3 feet

Avoidance is the best practice for effective groundwater protection on soils 2-3 feet. The mitigation practices that follow reflect interim or intermediate steps that farmers can implement on a voluntary basis to protect groundwater.

Applying manure on soils with 36 inches or greater depth to bedrock is best for pathogen reduction.

None of the mitigation practices below are meant to override meeting current performance standards (e.g., NR 151 and NR 243) or technical standards (e.g., NRCS 590) related to nutrient management or soil conservation.

2-3 feet to bedrock	Practices														
	1. Follow standard practices for > 2-20 feet to bedrock														
	2. Use NRCS soil units/maps, County maps and field verification to identify location of soils with bedrock < 40 inches														
	3. Avoid manure application on these soils and apply on other available acres OR if avoidance is not possible, implement all applicable mitigation practices (based on manure type) below:														
	a. Apply solid manure with significant pathogen reduction (composting);														
	b. Apply liquid manure with demonstrated pathogen treatment/reduction to 500,000 CFU/ ml or less AND implement the following: <ul style="list-style-type: none"> Do not exceed NR 214.17(4)(d), Table 3 application rates; use as low application rate as is safe and practical to avoid hydraulic loading of soil <p style="text-align: center;">Table 3 Maximum Weekly Volume of Liquid Waste to be Applied to Landspreading Sites (gal/ac/wk or in/wk)</p> <table border="1"> <thead> <tr> <th>Soil Texture</th><th>18"-36" Depth to Groundwater or Bedrock</th></tr> </thead> <tbody> <tr> <td>Sand</td><td>6,750 (¹/₄ in.)</td></tr> <tr> <td>Sandy Loam</td><td>13,500 (¹/₂ in.)</td></tr> <tr> <td>Loam</td><td>13,500 (¹/₂ in.)</td></tr> <tr> <td>Silt Loam</td><td>13,500 (¹/₂ in.)</td></tr> <tr> <td>Clay Loam</td><td>13,500 (¹/₂ in.)</td></tr> <tr> <td>Clay</td><td>6,750 (¹/₄ in.)</td></tr> </tbody> </table>	Soil Texture	18"-36" Depth to Groundwater or Bedrock	Sand	6,750 (¹ / ₄ in.)	Sandy Loam	13,500 (¹ / ₂ in.)	Loam	13,500 (¹ / ₂ in.)	Silt Loam	13,500 (¹ / ₂ in.)	Clay Loam	13,500 (¹ / ₂ in.)	Clay	6,750 (¹ / ₄ in.)
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Clay	6,750 (¹ / ₄ in.)														
	c. Apply liquid or solid manure to growing crop or within 10 days of crop establishment;														
	d. Limit solid manure application rate to 15 tons/acre/year;														
	e. Limit total liquid manure application rate to NR 214.17(4) (d), Table 3 rate or UW A2809 rate, whichever is less														

Sensitive Areas and Practices Workgroup
DRAFT Bedrock Depth Recommendations - 2-3 feet

2-3 feet to bedrock	Practices
	f. Split/reduce liquid manure application rate to reduce hydraulic loading of soil; factors to consider include: soil moisture and type (how much liquid can the field safely absorb) weather forecast, manure type and solids content and planned/planted cover crop stage;
	g. If liquid manure has < 2.0% dry matter (field average), reduce application rate by 50% and complete split applications;
	h. Use nitrification inhibitors and/or cover crops if they can be successfully established after application;
	i. Do not inject or incorporate manure below 4 inches depth
	j. For late summer and fall applications of manure and organic byproducts: <ul style="list-style-type: none"> • Use established/growing perennial crops or cover crops as first priority for application. • When a crop is growing, such as perennial crops, overwintering crops, double crops and cover crops, use rates that will not smother these crops and limit N rates to those specified in UWEX A2809 or to 120 lbs/acre, whichever is less. • For annual crops that will not be planted until the following spring or summer, delay applications until soil temp's are less than 50F or October 1st, whichever occurs first and limit manure N application to UWEX A2809 or to 90lbs/acre, whichever is less.
	k. For applications of liquid manure and/or organic by-products with less than or equal to 4.0% dry matter, limit application rates to criteria j. above and use a nitrification inhibitor or surface apply and do not incorporate for at least 3 days.

Sensitive Areas and Practices Workgroup
DRAFT Bedrock Depth Recommendations - 3-5 feet

Avoidance is the best practice for effective groundwater protection on soils 3-5 feet. The mitigation practices that follow reflect interim or intermediate steps that farmers can implement on a voluntary basis to protect groundwater.

Applying manure on soils with 36 inches or greater depth to bedrock is best for pathogen attenuation.

None of the mitigation practices below are meant to override meeting current performance standards (e.g., NR 151 and NR 243) or technical standards (e.g., NRCS 590) related to nutrient management or soil conservation.

3-5 feet to bedrock	Practices
	1. Follow standard practices for >2-20 feet to bedrock
	2. Use current NRCS and County bedrock depth maps and field verification to identify soils location
	3. Avoid manure application on these soils and apply on other available acres OR if avoidance not possible, implement all of the following mitigation practices:
	<p>a. Limit liquid manure application rate to 13,500 gallons/week* and follow UW A2809 to determine total liquid manure application; use low application rate that is safe and practical and avoid hydraulic loading of soil</p> <p>* = weekly liquid manure application rate helps reduce groundwater pathogen risk but may not reduce nitrate loading/loss risk</p>
	<p>b. For late summer and fall applications of manure and organic byproducts:</p> <ul style="list-style-type: none"> • Use established/growing perennial crops or cover crops as first priority for application. • When a crop is growing, such as perennial crops, overwintering crops, double crops and cover crops, use rates that will not smother these crops and limit N rates to those specified in UWEX A2809 or to 120 lbs/acre, whichever is less. • For annual crops that will not be planted until the following spring or summer delay applications until soil temp's are less than 50F or October 1st, whichever occurs first and limit manure N application to UWEX A2809 or to 90lbs/acre, whichever is less.
	c. For applications of liquid manure and/or organic by-products with less than or equal to 4.0% dry matter, limit application rates to criteria 3(b) above and use a nitrification inhibitor or surface apply and do not incorporate for at least 3 days;
	<p>d. Limit solid manure application to UW A2809 rates and incorporate*¹ within 72 hours;</p> <p>* = does not apply to no tillage practices OR fields with perennial forage and other established crops</p>
	e. Do not inject or incorporate manure below 6 inches depth;
	f. Implement as many applicable mitigation practices for 2-3 feet to bedrock soils [3(a-c) and 3(f-h)] as practicable

¹ Incorporate means using mechanical equipment to mix applied manure into the soil as much as practicable/possible.

Sensitive Areas and Practices Workgroup
DRAFT Bedrock Depth Recommendations - 5-20 feet

Applying manure on soils with 36 inches or greater depth to bedrock is best for pathogen attenuation.

None of the mitigation practices below are meant to override meeting current performance standards (e.g., NR 151 and NR 243) or technical standards (e.g., NRCS 590) related to nutrient management or soil conservation.

5-20 feet to bedrock	Practices														
	1. Follow standard practices for >2-20 feet to bedrock														
	2. Use current NRCS or County bedrock depth maps and field verification to identify soils location														
	3. Implement the following mitigation practices:														
	a. Limit weekly liquid manure application rate to NR. 214.14(4)(d), Table 3 (below) and follow UW A2809 to determine total liquid manure application; use as low application rate that is safe and practical; avoid hydraulic loading of soil by using split applications														
	<p style="text-align: center;">Table 3 Maximum Weekly Volume of Liquid Waste to be Applied to Landspreading Sites (gal/ac/wk or in/wk)</p> <table> <tr> <th>Soil Texture</th><th>Greater than 36" Depth to Groundwater or Bedrock</th></tr> <tr> <td>Sand</td><td>13,500 (¹/₂ in.)</td></tr> <tr> <td>Sandy Loam</td><td>27,000 (1 in.)</td></tr> <tr> <td>Loam</td><td>27,000 (1 in.)</td></tr> <tr> <td>Silt Loam</td><td>27,000 (1 in.)</td></tr> <tr> <td>Clay Loam</td><td>20,000 (³/₄ in.)</td></tr> <tr> <td>Clay</td><td>13,500 (¹/₂ in.)</td></tr> </table>	Soil Texture	Greater than 36" Depth to Groundwater or Bedrock	Sand	13,500 (¹ / ₂ in.)	Sandy Loam	27,000 (1 in.)	Loam	27,000 (1 in.)	Silt Loam	27,000 (1 in.)	Clay Loam	20,000 (³ / ₄ in.)	Clay	13,500 (¹ / ₂ in.)
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Clay	13,500 (¹ / ₂ in.)														
	b. Limit solid manure application to UW A2809 rates and incorporate** within 72 hours; * = does not apply to no till fields following no-tillage practices OR fields with perennial forage and other established crops														
	c. Do not inject or incorporate manure below 8 inches depth														
	d. As many applicable mitigation practices for 2-3 feet to bedrock soils [3(a-c) and 3(f-h)] as practicable														

² Incorporate means using mechanical equipment to mix applied manure into the soil as much as practicable/possible.

Sensitive Areas and Practices Workgroup
DRAFT Bedrock Depth Recommendations - 2-20 feet

None of the standard practices below are meant to override meeting current performance standards (e.g., NR 151 and NR 243) or technical standards (e.g., NRCS 590) related to nutrient management or soil conservation.

>2-20 feet to bedrock	Standard Practices
	1. Use Kewaunee County, NRCS soils/maps or DNR CAFO maps and field verification to identify location of soils
	2. No application of manure or other wastes:
	a. When rainfall > 1 inch is forecast within 24 hours
	b. When DATCP Manure Management Advisory System is RED within application area
	c. Within closed depressions* in fall after crop harvest unless: (1) manure is injected (following tillage practice #9 below) or immediately incorporated ³ AND (2) successful establishment** of fall seeded forage crop within application area(s) * = Closed depressions can be located using topographic maps and visual interpretation, DNR's EVAAL tool or other ArcGIS tools that use Light Detection and Ranging (LIDAR) surveys. Closed depressions may not reflect the definition of direct conduits to groundwater within NR 151 and NR 243. ** = Successful establishment means a fall seeded crop germinates and grows to provide substantial vegetative cover of entire field; bare soil area(s) are avoided or minimized to isolated/small areas.
	d. In spring or summer - within 100 feet of low area(s), where water regularly ponds up to seasonal high water mark, located inside of closed depressions – NOTE: low areas mean bowl shaped area(s) in field with no natural drainage outlet
	e. In spring or summer - within one mile radius of any area that drains into low areas within closed depressions (up to seasonal high water mark), unless manure is injected or incorporated* within 24 hours or prior to any rainfall event, whichever occurs first. * = does not apply to no fields following no-tillage practices OR fields with perennial forage and other established crops.
	3. No emergency spreading or headland stacking on frozen or snow covered soils* * = already covered by Kewaunee County Ordinance, including exceptions
	4. Before applying manure, evaluate and rank fields with low, medium and high risk based upon criteria i-v., below; low risk fields are first priority for application. Avoid high risk fields or use as a last resort. i. % of restricted area within field from setbacks and slope ii. Number of identified karst features within or immediately adjacent to field iii. % field area with identified fracture traces iv. Number of channel(s) in field that lead to identified groundwater conduits or recharge areas within or adjacent to field v. Evaluate soil type, soil conditions, soil depth to bedrock on fields and weather conditions

³ Incorporate means using mechanical equipment to mix applied manure into the soil as much as practicable/possible.

>2-20 feet to bedrock	Standard Practices
	5. Implement practices that build soil organic matter (e.g., crop rotation, cover crops, high residue crops, reduced tillage, rotational grazing)
	6. No surface application* on slopes greater than 6% unless spread material immediately incorporated ⁴ or injected; no surface application on slopes greater than 12%; * = does not apply to perennial forage or other established crops
	7. When surface applying manure before planting or after harvest, complete incorporation* within 24 hours or before a rain event, whichever is sooner; * = does not apply to perennial forage and other established crops
	8. Apply nitrogen based fertilizers as close to the time of crop establishment as possible or on established crops to minimize N losses below the crop root zone and to groundwater
	9. Complete tillage* prior to application of liquid manure to a minimum of two inches below depth of manure injection/incorporation * = does not apply to fields following no-tillage practices OR fields with perennial forage and other established crops
	10. Headland application (from equipment turning) shall be incorporated within 6 hours or before applying a different field or before a rain event, whichever occurs first

⁴ Incorporate means using mechanical equipment to mix applied manure into the soil as much as practicable/possible.